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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/023,847

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Akira Mitsui

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FOLEY AND LARDNER
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EXAMINER

TRAN, BINH X

ART UNIT PAPER NUMBER

1765

DATE MAILED: 06/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/023,847

Examiner

Binh X Tran

Applicant(s)

MITSUIKI, AKIRA

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2003.
- 2a) ☐ This action is **FINAL**.
- 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) 7 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5 and 6 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☒ Claim(s) 7 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3, 4.

- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I (claims 1-6) in Paper No. 7 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).
2. Claim 7 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 7.

Claim Interpretation

3. In line 9-10 of claim 1, the applicants wrote, "where the etching rate in the vicinity of the side of the resist pattern is higher than the etching rate of other areas". The examiner interprets there are two different areas around the side of the resist pattern: outside area and inside area. A prior art teaching that the etching rate in the vicinity of the outside of the sidewall of the resist pattern is higher than the etching rate of the inside (i.e. other areas) side of the resist pattern will read on this limitation.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 3, 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aminpur et al. (US 6,482,726) in view of Lowrey (US 5,328,810).

Aminpur discloses a method for forming a fine pattern, comprising:
a lithography step for forming a resist pattern (560) on a film to be processed deposited on a substrate (505) using a lithography process (col. 6 lines 1-4, Fig 5);
a first etching step for etching the resist pattern (560) to narrow the line width of the resist pattern (560) to resist pattern (570) with the line width of δ_{trim} (col. 6 lines 4-21, Fig 5);

a second etching step for performing anisotropic etching to a first film (550) underneath the resist pattern (570) where the etching rate in the vicinity of the outside area (655) of the sidewall of the resist pattern is higher than the etching rate of the other area (650) to expose the second film underneath the first film in the vicinity of the sidewall of the resist pattern, and to form the pattern of the first film (650) (Fig 6, col. 6 lines 21-40, read on applicants second etching step; See claim interpretation for further detail);

a third etching step for etching the second film using the pattern of the first film (650) as a mask, to form a pattern pitch having the width of Δ which is smaller than the pitch δ_{trim} of the resist pattern (Fig 7, col. 6 line 41 to col. 7 line 8).

Aminpur fails to disclose the pattern pitch of the second film is $\frac{1}{2}$ the pitch of the resist film. However, Aminpur clearly discloses that the pattern pitch Δ is smaller than the pitch δ_{trim} of the resist pattern as well as the width of the pitch Δ is a result effective variable. Lowrey teaches to form a pitch equal $\frac{1}{2}$ the pitch of the resist pattern (F) (col.

6 and/or abstract). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Aminpur in view of Lowrey by forming the pitch of $\frac{1}{2}$ the pitch of the resist pattern because this process permit a reductions in the minimum pitch of the primary mask. Further both Aminpur and Lowrey teaches that the pattern pitch value is a result effective variable. The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain pattern pitch as an expected result.

Respect to claim 3, Aminpur teaches the first film is a nitride and the second film is oxide (col. 5 lines 40-50). Respect to claim 5, Aminpur further teaches a fourth etching step comprise an anisotropic etching step to the third film (515) under the second film using the pattern (740) as a mask obtained from the third etching to form the desire line width Δ and space width (i.e., width of phantom layer 820) (See Fig 8, col. 7 lines 16-30). Respect to claim 6, both Aminpur and Lowrey teaches to form a semiconductor device.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aminpur and Lowrey as applied to claim 1 above, and further in view of Fan et al. (US 6,124,212).

Claim 2 differs from Aminpur and Lowrey by the specific value of pressure of the etching gas. In an etching method, Fan discloses the pressure is a result effective variable. Fan further teaches to vary the pressure from 4.5-5.5 mTorr (4.5-5.5 mTorr \approx

0.6-0.73 Pa) (col. 8 lines 45-50, within applicant's range). The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention to perform routine experiment to obtain optimal pressure as an expected result.

Allowable Subject Matter

7. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: The cited prior arts fail to disclose the third etching step comprise anisotropic etching to the second film using the pattern of the first film as a mask, then performing isotropic etching step to obtain a pattern of a desire line width and space width. The closest prior art (Aminpur) only disclose a single anisotropic etching the second film.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (703) 308-1867. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on (703) 308-3836. The fax phone

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numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Binh X. Tran
June 25, 2003


GREGORY MILLS
SUPERVISORY PATENT EXAMINER
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